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Cosmetic sunscreen formulations provide protection against UVR-induced mitochondrial DNA damage in human skin cells

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Mitochondrial DNA damage has been shown to be a reliable and sensitive biomarker of UVR exposure in human skin. In this study, the protective effect of a cosmetic sunscreen formulation with SPF30 and broadband UVA/UVB protection was analyzed using primary human skin cells (keratinocytes and fibroblasts), following ultraviolet (UV) irradiation at a range similar to that of sunlight. This UV range was obtained using 2 lamp types, which were (a) a solar simulator (Newport) and (b) Arimed B lamps in a sunbed. Mitochondrial DNA (mtDNA) was used as a biomarker of solar simulated UV-induced damage in the skin cells. A control product without UV filters was also included in the study. The efficiency of these formulations to prevent UV-induced damage was analyzed by applying the products (2 mg/cm^2) to Transpore tape covering Petri dishes containing primary human skin cells, followed by UV irradiation. It was observed that with both fibroblasts and keratinocytes, mtDNA damage was present when cells were irradiated with the Arimed B lamps in the presence of non-SPF formulation ($P<0.0001$) to a similar extent to that of tape alone ($P<0.0001$). This increase in damage compared to foil-covered cells was an approximately 2-fold difference in damage. In comparison, both cell types irradiated in the presence of the SPF30 formulation showed no increase in mtDNA damage as compared to the foil-covered cells ($P>0.05$). This suggests that the cosmetic sunscreen formulation containing SPF30 cream is providing mtDNA protection to a similar extent as that provided by the foil at a dose of 2 SED. Similar results were obtained when the cells were irradiated with the solar simulator; however mtDNA damage was induced to a lesser extent, possibly due to differences in exposure times between the 2 lamps. Overall, these results suggest that the SPF30 formulation tested in this work is efficient at protecting human skin cells from sunlight-induced damage; future work would be required to determine whether this is a phenomenon also observed in human skin *in vivo*.